



## Summary of Fishery Surveys Upper Flambeau River Flowages, Price County, 2010 – 2011

WDNR's Fisheries Management Team from Park Falls completed fyke netting and electrofishing surveys in 2010 and 2011 to assess the status of important fish populations in Upper Park Falls Flowage, Lower Park Falls Flowage, Pixley Flowage, and Crowley Flowage. Fyke netting in October gave us information on black crappies. Fyke nets deployed again shortly after the spring thaw targeted northern pike, walleye, yellow perch, and muskellunge. A late-spring electrofishing survey documented the abundance and size structure of smallmouth bass and bluegill populations. Quality, preferred, and memorable sizes referenced in this summary are based on standard proportions of world record lengths developed for each species by the American Fisheries Society. "Keeper size" is based on known angler behavior.

### Survey Effort

The number of fyke nets deployed and the shoreline distances sampled in our netting and electrofishing surveys followed the standards based on lake size. We fished fall nets over one night in all four flowages. The number of net-nights in fall was equal to the number of fyke nets set in each flowage in both spring and fall netting surveys. To optimize the timing of surveys scheduled in these and other waters, we fished our spring fyke nets two consecutive nights before tending them in Upper Park Falls Flowage and three consecutive nights before tending them in Pixley and Crowley flowages. In Lower Park Falls Flowage we tended spring nets daily and sampled the entire shoreline by electrofishing.

	Fall fyke nets	Early spring fyke nets	Late spring electrofishing May 18-31, 2011			
	Sep 30-Oct 14, 2010	April 11-19, 2011	58.8 - 64.3°F			
	56.8 - 57.3°F	40.3 - 42.4°F	Gamefish		Panfish	
	Net-nights	Net-nights	Miles	Hours	Miles	Hours
Upper Park Falls	5	20	3.00	1.50	1.00	0.50
Lower Park Falls	3	9	3.40	1.67	0.50	0.33
Pixley	5	20	3.00	1.43	0.50	0.28
Crowley	5	20	3.00	1.53	0.50	0.30

In most cases, our survey effort occurred within the range of water temperature at which the targeted adult population would be most vulnerable to our capture gear. However, spring fyke netting ended before muskellunge spawned, so those samples probably do not fully represent adult population status. Similarly, bluegills typically do not spawn until water temperature reaches 70°F, but we expect that adult bluegills were staged in shallow water or building nests when we completed our electrofishing surveys. Electrofishing samples should adequately reflect the status of smallmouth bass whose spawning activities can be triggered by variable temperature thresholds.

## Background and Habitat Characteristics

Four earthen dams, built in the late 1800s and early 1900s to provide mechanical power for sawing and grinding and later converted for hydroelectric generation, form a series of narrow riverine impoundments on the North Fork Flambeau River, near Park Falls, WI that are collectively known as the Upper Flambeau River Flowages. Renewable World Energies, L.L.C., an affiliate of the licensee, Flambeau Hydro, L.L.C., owns and operates the hydroelectric projects under authority granted by the Federal Energy Regulatory Commission. The four hydropower projects produce electricity in a “run-of-river” operational mode, maintaining a near-constant reservoir elevation by closely matching inflow and discharge. WDNR staff completed comprehensive fishery surveys in the Upper Flambeau River Flowages in 1989 – 1992 for the environmental review of the hydroelectric projects’ license renewal applications. Searchable information on project features, operational constraints, fishery survey results, and measures for natural resource protection is available on the Commission’s e-Library at [www.ferc.gov](http://www.ferc.gov).

		Upper Park Falls	Lower Park Falls	Pixley	Crowley
River mile (upstream from mouth)		93.6	91.6	87.0	81.4
Surface area (acres)		431	71	334	422
Shoreline length (miles)		15.4	4.2	8.1	16.2
Authorized reservoir elevation (feet MSL)		1,487.4 ± 0.25	1,468.0 ± 0.25	1,448.7 ± 0.25	1,428.0 ± 0.25
Maximum depth (feet)		17	16	23	23
Mean depth (feet)		8	8	5	8
Volume (acre-feet)		3,279	571	1,757	3,539
% Surface area < 3 feet deep		24	2.5	15	21
Substrate	Rock	45	70	70	15
	Gravel	--	5	5	--
	Sand	50	--	15	--
	Muck	5	25	10	85
Mid-summer Secchi depth (feet)		3.5	--	3	3
Trophic state		eutrophic	eutrophic	eutrophic	eutrophic
Public boat landings		3	1	2	1
Capacity (megawatts)		900	1,200	960	1,500
FERC Project No.		P-2640	P-2421	P-2395	P-2473

It appears that some lowland forested areas were left intact with standing timber when they were flooded after dam construction, and as a result submerged and partially submerged woody structure is plentiful, especially in shallow bays. Low water clarity indicates high nutrient concentrations and high biological productivity—water quality characteristics that allow us to classify the Upper Flambeau River Flowages

as eutrophic. For decades wood fiber and wastewater discharged to the upper reaches of the Flambeau River from paper and lumber manufacturing industries near Park Falls severely degraded water quality, often resulting in extensive fishkills. Though water quality has improved with mandated advances in wastewater treatment in the 1970s and 1980s, evidence of past practices still persists in deep deposits of contaminated organic sediments in Lower Park Falls, Pixley, and Crowley flowages. In its publication, *Choose wisely – 2014, A health guide for eating fish in Wisconsin*, WDNR offered specific advice that people of certain age and gender should limit their consumption of fish from these waters.

Each impoundment has a canoe portage and at least one public boat landing. The City of Park Falls, Price County, and the hydropower licensee maintain various recreational facilities, including campgrounds, parks, pavilions, trails, and shorefishing piers. Shoreland condition varies considerably with segments developed for seasonal and year round homes, the paper manufacturing industry, an airport, and a golf course. However, much of the shoreline remains in a near-natural state.

## Summary of Results

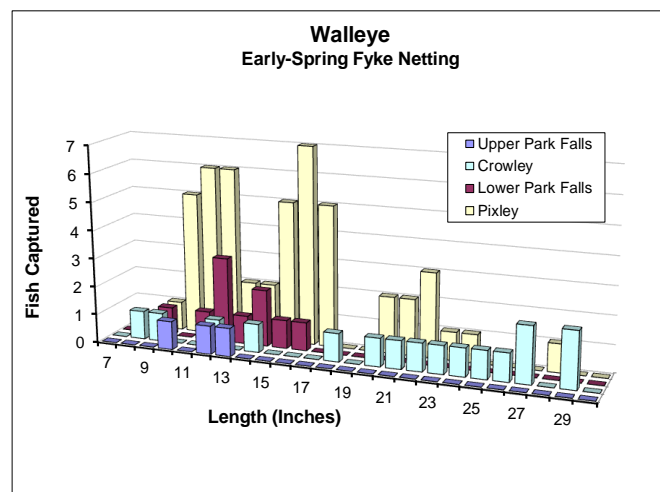
Our atypical survey results reflected the challenges we faced in effectively sampling fish populations in river systems where fish can move long distances in impounded and free-flowing reaches, and where seasonally high discharge often limits our options on the types and the locations of gear we can safely deploy in spring. It is important to note that fish can roam freely within the river segments and their tributaries separated by dams. Radio-telemetry, mark-recapture, hydroacoustic, and tailrace netting studies all documented downstream passage of fish through the hydroelectric turbines and spillways of these four dams, but all four structures are impassable barriers to upstream fish movement.

We captured 21 fish species in our netting and electrofishing surveys. Species richness was comparable to or slightly higher than that found with similar survey effort in medium-size rivers of northern Wisconsin. The fish assemblage included lake sturgeon, a species of Special Concern in Wisconsin, and past surveys documented greater redhorse, formerly listed as Threatened and now as Special Concern under Wisconsin's Endangered Species Act.

### Walleye



	Number per net-night $\geq 10"$	Quality Size $\geq 15"$	Preferred Size $\geq 20"$	Memorable Size $\geq 25"$
Upper Park Falls	0.2	0%	0%	0%
Lower Park Falls	1.0	22%	0%	0%
Pixley	2.4	56%	21%	2%
Crowley	0.7	86%	79%	43%



A comparison of walleye capture rates in early spring fyke nets revealed that among the four impoundments Pixley Flowage had the highest abundance, while Crowley Flowage had the highest proportions of preferred- and memorable-size fish. With unimpeded access to 15 free-flowing river miles upstream to the Turtle-Flambeau Dam, we suspect (based on tracking the seasonal movements of radio-tagged walleyes in

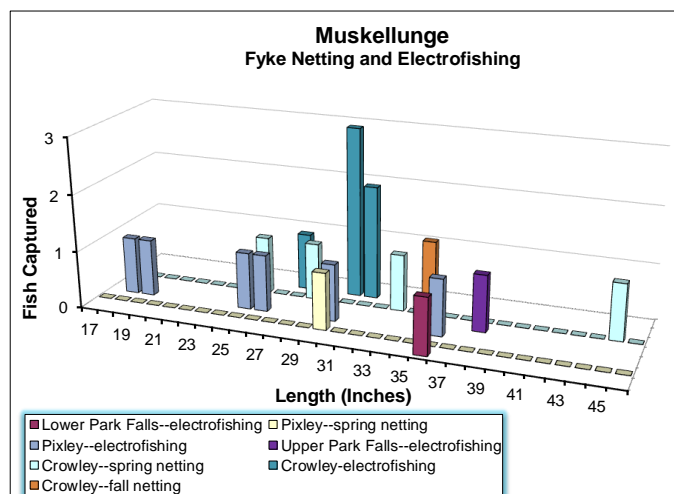
1989–1992) that adults move upstream to more suitable spawning habitat in spring and that walleye population abundance between the Upper Park Falls and Turtle-Flambeau dams was higher than our low netting catch rate in Upper Park Falls Flowage indicated. Even without direct evidence of recruitment from fall electrofishing surveys, young walleyes captured in each flowage in spring indicate that natural reproduction can sustain the adult population at fishable levels of abundance without stocking. Except the accounts of nearly a million fry and 4,700 fingerling walleyes stocked into Upper Park Falls Flowage in 1933–1945, we found no other record of walleyes stocked into any of the Upper Flambeau River Flowages.

## Muskellunge



### Early Spring Fyke Nets

	Number per net-night $\geq 20"$	Quality Size $\geq 30"$	Preferred Size $\geq 38"$	Memorable Size $\geq 42"$
Upper Park Falls				
Lower Park Falls				
Pixley	0.1	100%	0%	0%
Crowley	0.2	50%	25%	25%



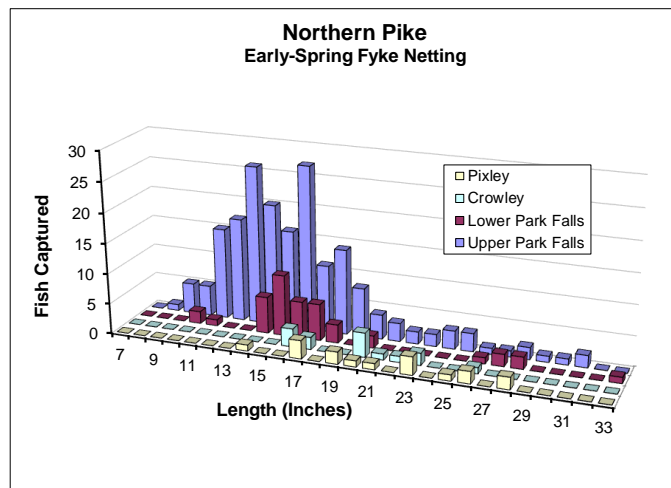
Walleyes were the primary target of early spring netting, and because water temperature remained substantially below the optimum of muskellunge spawning activity (55°F; range 49–60°F) for the entire 8-day survey duration, fyke nets captured few muskies in all four flowages. Though none of our samples is particularly useful to represent musky population abundance, a pooled sample from all spring and fall surveys offers some insight about the range of muskellunge sizes. The small- and intermediate-size fish (presumed to be age 12 or younger) in our imperfect samples nonetheless provide convincing evidence that natural reproduction has produced several year classes to sustain the adult population since muskies were last stocked. Muskellunge fingerlings were stocked only into Upper Park Falls Flowage, beginning regularly in 1952, and almost annually in 1960–1993, but not at all since 2000.

## Northern Pike



### Early Spring Fyke Nets

	Number per net-night $\geq 14"$	Quality Size $\geq 21"$	Preferred Size $\geq 28"$	Memorable Size $\geq 34"$
Upper Park Falls	6.3	17%	5%	0%
Lower Park Falls	4.6	15%	8%	0%
Pixley	0.8	56%	13%	0%
Crowley	0.8	36%	0%	0%



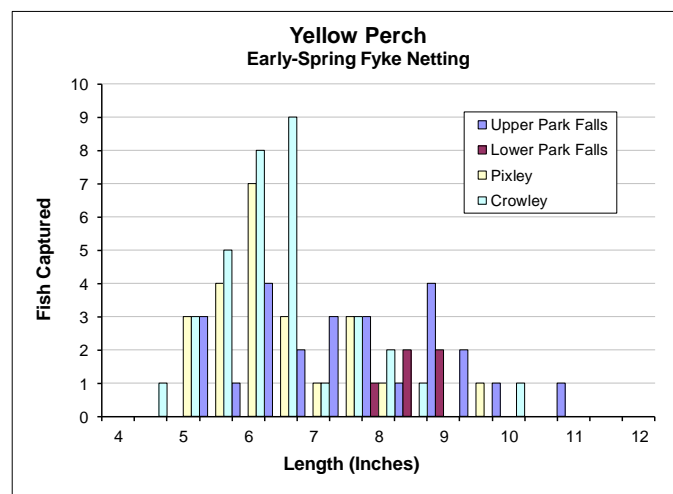
We cannot know with certainty whether the higher capture rates of northern pike in early spring fyke nets reflect higher population abundance in Upper Park Falls and Lower Park Falls flowages compared to Pixley and Crowley flowage, or if by placing our nets first in Upper and Lower flowages (first and second impoundments in downstream sequence) we captured pike there at the peak of their spawning activity, which may have subsided somewhat over several days before we moved our nets downstream into Pixley and Crowley flowages (third and fourth in downstream sequence). Though pike are the earliest of spring spawners and are often active before the ice thaws, we believe that the timing of our netting surveys was appropriate to represent population status in these waters. Water temperature recorded at each net lift was similar in all four flowages, averaging 40, 43, 41, and 43°F, respectively in upstream to downstream sequence. Though none of the populations had an impressive size structure, northern pike in Pixley and Crowley flowages at lower levels of abundance had higher proportions of larger fish.

## Yellow Perch



### Early Spring Fyke Nets

	Number per net-night $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$
Upper Park Falls	1.3	48%	8%
Lower Park Falls	0.6	100%	0%
Pixley	1.2	9%	0%
Crowley	1.7	12%	3%



### Late Spring Electrofishing

	Number per mile $\geq 5"$	Number per hour $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$
Upper Park Falls	5.0	10	0%	0%
Lower Park Falls	4.0	6.1	50%	0%
Pixley	10	18	20%	0%
Crowley	6.0	10	0%	0%



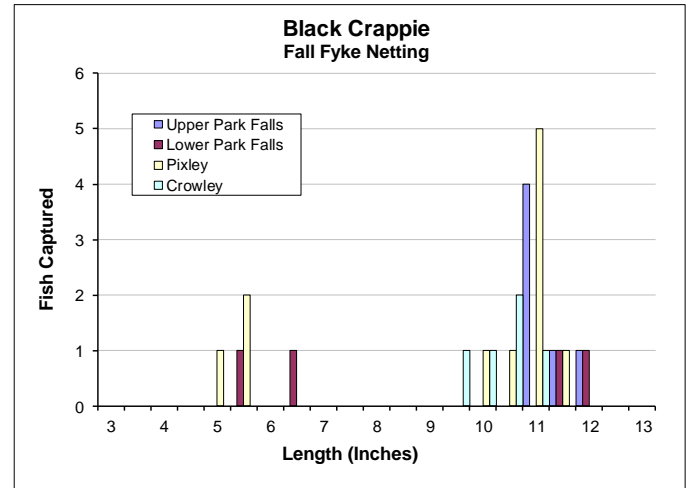
Early spring fyke nets and late spring electrofishing together portrayed a yellow perch population in low abundance. Unlike many local perch populations that offer little or no angling opportunity, our surveys found perch  $\geq 8$  inches in all four flowages. Young perch serve as the favorite food of walleyes, and both northern pike and muskellunge tend to selectively eat the largest perch to obtain an efficient ration.

## Black Crappie



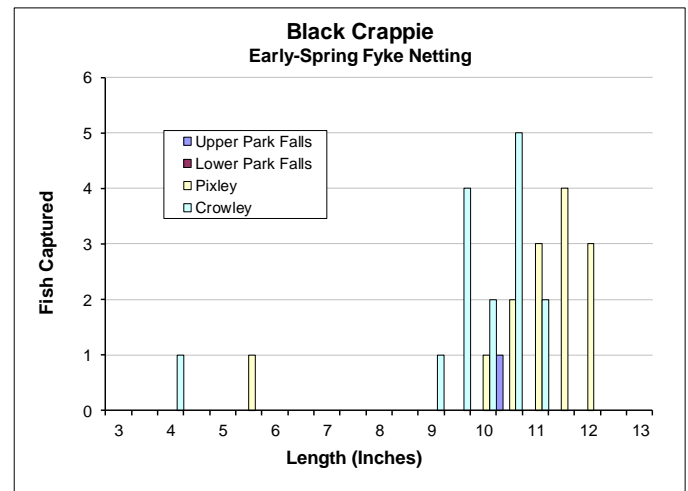
### Fall Fyke Nets

	Number per net-night $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$	Memorable Size $\geq 12"$
Upper Park Falls	1.2	100%	100%	17%
Lower Park Falls	1.3	50%	50%	25%
Pixley	2.2	73%	73%	0%
Crowley	1.0	100%	80%	0%



### Early Spring Fyke Nets

	Number per net-night $\geq 5"$	Quality Size $\geq 8"$	Preferred Size $\geq 10"$	Memorable Size $\geq 12"$
Upper Park Falls	0.1	100%	100%	0%
Lower Park Falls				
Pixley	0.7	93%	93%	21%
Crowley	0.7	100%	64%	0%



Our low capture rates of black crappies in fall and early spring fyke nets in all four flowages revealed low population abundance that allows crappies to grow at satisfactory rates to produce higher-than-average proportions of preferred- and memorable-size fish. Crappies grew at similar rates across these four flowages. Ages estimated from pooled scale samples showed that crappies grew to 10.9 inches in 7 years (range 10.4–11.3;  $n = 6$ ) and 11.5 inches in 9 years (range 11.0–2.0;  $n = 7$ ), nearly identical to the regional average length at those ages. Black crappies starting the year 9.2 to 12.0 inches long gained on average 0.47 inch by the end of the growing season (range 0.25–1.00;  $n = 21$ ), a respectable growth increment for older crappies. Under presumably low to moderate fishing pressure and harvest, the population can produce a decent share of crappies in the sizes that anglers like to catch and keep. Anglers should follow the advice published in *Choose wisely – 2014, A health guide for eating fish in Wisconsin* and limit the meals of crappies they eat from these waters.

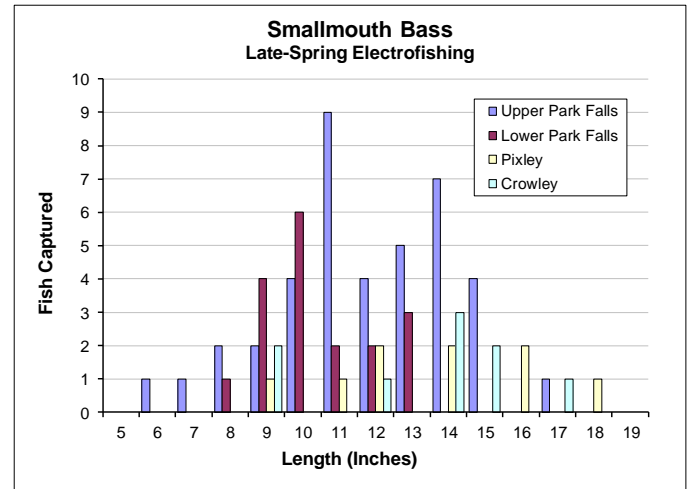


## Smallmouth Bass



### Late Spring Electrofishing

	Number per mile $\geq 7''$	Number per hour $\geq 7''$	Quality Size $\geq 11''$	Preferred Size $\geq 14''$	Memorable Size $\geq 17''$
Upper Park Falls	13	26	77%	31%	3%
Lower Park Falls	5.3	11	39%	0%	0%
Pixley	3.0	6.3	89%	56%	11%
Crowley	3.0	5.9	78%	67%	11%



The electrofishing capture rates of smallmouth bass in late spring indicated the highest population abundance in Upper Park Falls Flowage and similar low levels of abundance in the other impoundments. Consistent with relatively low abundance, the length distribution of our samples revealed respectable proportions of preferred- and memorable-size bass, especially in Pixley and Crowley flowages.

In those two reservoirs a local bass fishing league recorded smallmouth bass larger than those we captured by electrofishing. In eleven fishing contests usually held from 6:00 to 8:30 p.m. in August 2011 – 2015 on Pixley and Crowley flowages 4–10 participants (average 7.6 anglers per contest) caught and released 89 legal-size smallmouth bass 14.0 – 20.5 inches long in 222 angler-hours, registering on average one legal-size smallmouth bass in 2.49 hours of directed fishing effort (range 1.46–5.00 hours). Tournament anglers could register only their two largest legal-size bass, but organizers often noted that contestants also caught “many,” “quite a few,” or “lots of” sublegal-size bass < 14 inches long. A third of the smallmouth bass registered were of memorable size. League organizers noted and we found declining trends in registered bass per angler-hour in both flowages over the five-year period.

Though we did not weigh fish to quantify their condition factor, smallmouth bass in all four flowages appeared plump for their length with body shape resembling a football, perhaps because coarse rock covers a high percentage of each reservoir bottom, providing ideal substrate essential to produce and harbor plenty of crayfish, the favorite food of smallmouth bass.

Smallmouth bass ages varied considerably among the four flowages, but our samples were too small for valid comparisons. Despite their apparent robust condition, smallmouth bass gained length slower than the average rate. A combined sample from all four flowages showed that smallmouth bass attained 10.5 inches in 4 years (range 9.5–11.8; n = 5), 11.2 inches in 5 years (range 10.2–12.4; n = 14) and 13.0 inches in 6 years (range 10.9–16.8; n = 16), significantly below the regional average length of 11.1, 13.3, and 15.0 inches at those ages. Our confidence in the accuracy of smallmouth bass ages estimated from scales was low to moderate, especially for the larger, older fish.

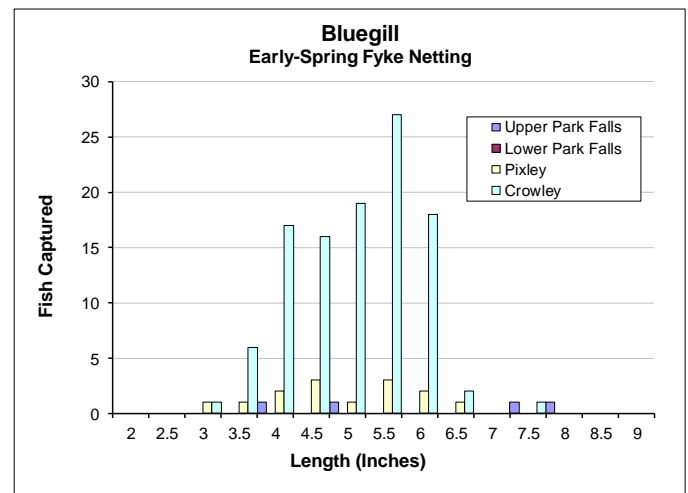
Largemouth bass were absent in all recent surveys.

## Bluegill



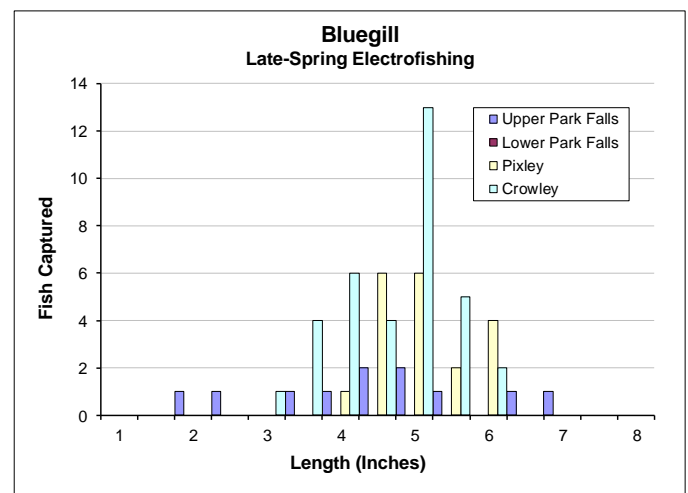
### Early Spring Fyke Nets

	Number per net-night $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$	Preferred Size $\geq 8''$
Upper Park Falls	0.2	50%	50%	25%
Lower Park Falls				
Pixley	0.7	21%	0%	0%
Crowley	5.4	20%	0.9%	0%



### Late Spring Electrofishing

	Number per mile $\geq 3''$	Number per hour $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$
Upper Park Falls	9.0	18	22%	11%
Lower Park Falls				
Pixley	38	68	21%	0%
Crowley	70	117	6%	0%



The bluegill fishery in the Upper Flambeau River flowages undoubtedly draws little attention from panfish anglers who want to keep some fish for a meal. Bluegills captured in early spring fyke nets and by late spring electrofishing indicated low abundance in all four flowages, yet each population had surprisingly low proportions of keeper-size fish 7 inches and longer even though we found no signs of crowding and intense food competition. Riverine habitat and flow coupled with fish community interactions strongly influence recruitment, survival, and growth rates in these bluegill populations. Netting and electrofishing capture rates revealed the highest bluegill abundance in Crowley Flowage, where greater expanses of fine substrate is conducive for growth of aquatic plants that yield invertebrate food and provide cover for bluegills. We cannot explain why these bluegill populations do not produce more large fish at such low levels of abundance.

Survey data collected and analyzed by: Kendal Patrie, Rebecca Pawlak, Greg Rublee, and Jeff Scheirer—WDNR Fishery Team, Park Falls.

Written by: Jeff Scheirer—Fishery Biologist, February 16, 2016

Reviewed and approved for web posting by: Mike Vogelsang—Northern Administrative District Supervisor, INSERT DATE



WISCONSIN CONSERVATION DEPARTMENT

## LAKE SURVEY MAP

UPPER PARK FALLS

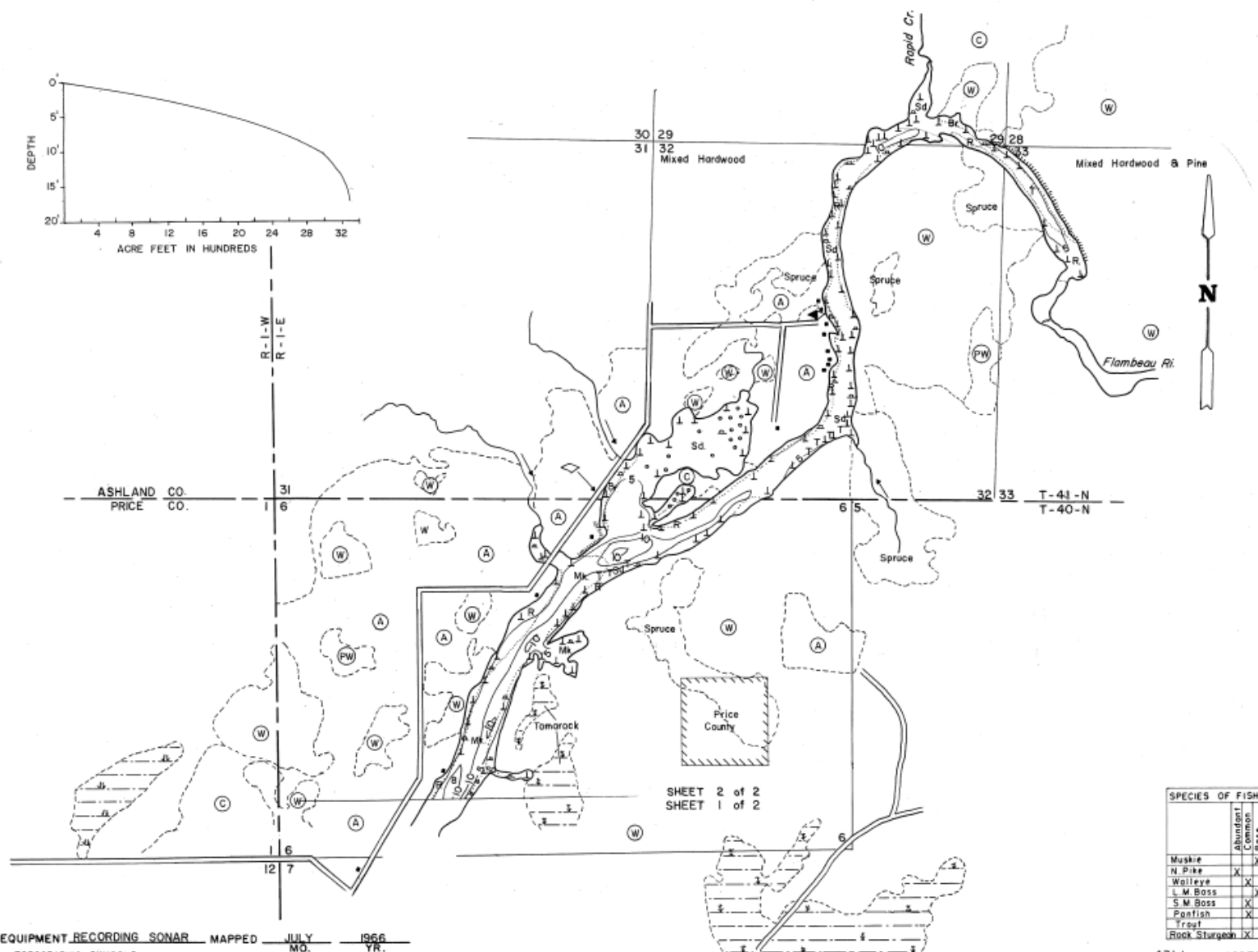
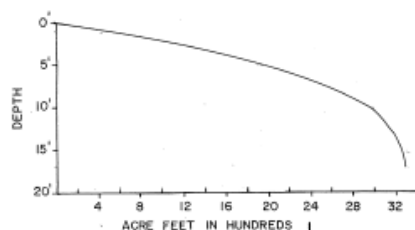
PRICE &amp; ASHLAND

LAKE

COUNTY

SEC. 6, 7, 12, 13, 31, 32 T. 40, 41 N. R. 1, 2 E.W.

(Sheet 2 of 2)

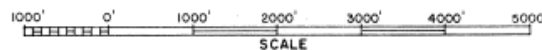


EQUIPMENT RECORDING SONAR MAPPED JULY 1966

TOPOGRAPHIC SYMBOLS

- ① Brush (-----) Steep slope
- ② Partially wooded (-----) Indefinite shoreline
- ③ Waded (-----) Marsh
- ④ Cleared (-----) Spring
- ⑤ Pastured (-----) Intermittent stream
- ⑥ Agricultural (-----) Permanent inlet
- B.M. Bench Mark (-----) Permanent outlet
- Dwelling (-----) Dam
- Resort (-----) Lake Bottom Symbols
- P. Peat Gr. Gravel Ss Stumps & Snags
- Mk. Muck R. Rubble
- C. Clay Br. Bedrock
- M. Marl T. Submergent vegetation
- Sd. Sand I. Emergent vegetation
- St. Silt F. Floating vegetation

WATER ELEV. 1482



◇ Access    ◀ Access with Parking    ◆ Boat Livery

Field work by C. Busch, G. Winter, L. Sathar Drawn by: C. Holt

SPECIES OF FISH		
	Abundant	Common
Muskie		X
N. Pike	X	X
Walleye	X	X
L. W. Bass	X	X
S. W. Bass	X	X
Pontfish	X	X
Trot	X	X
Rock Sturgeon	X	X

AREA 431.1 ACRES

UNDER 3 FT. 24.4 %

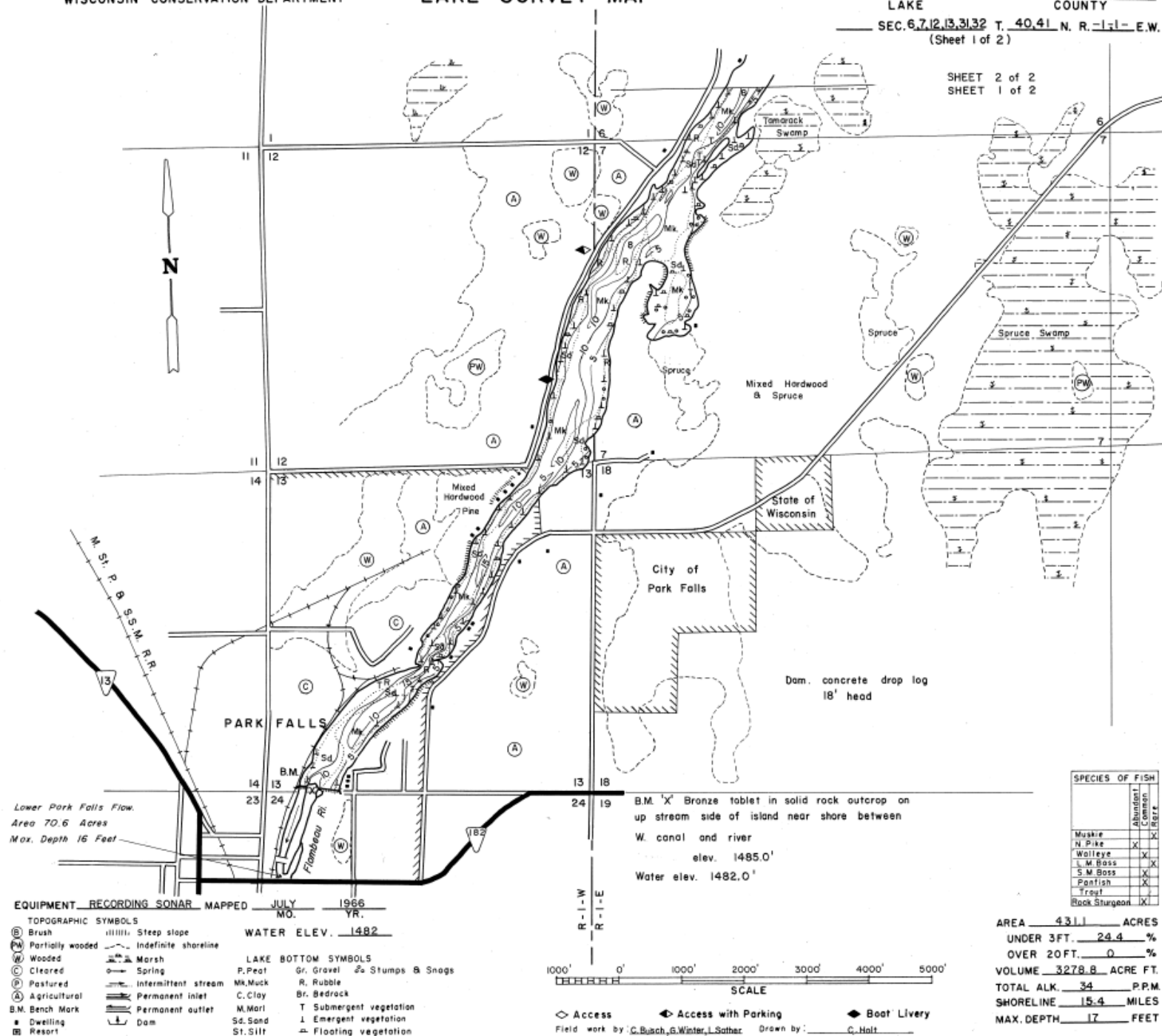
OVER 20 FT. 0 %

VOLUME 3278.8 ACRE FT.

TOTAL ALK. 34 P.P.M.

SHORELINE 15.4 MILES

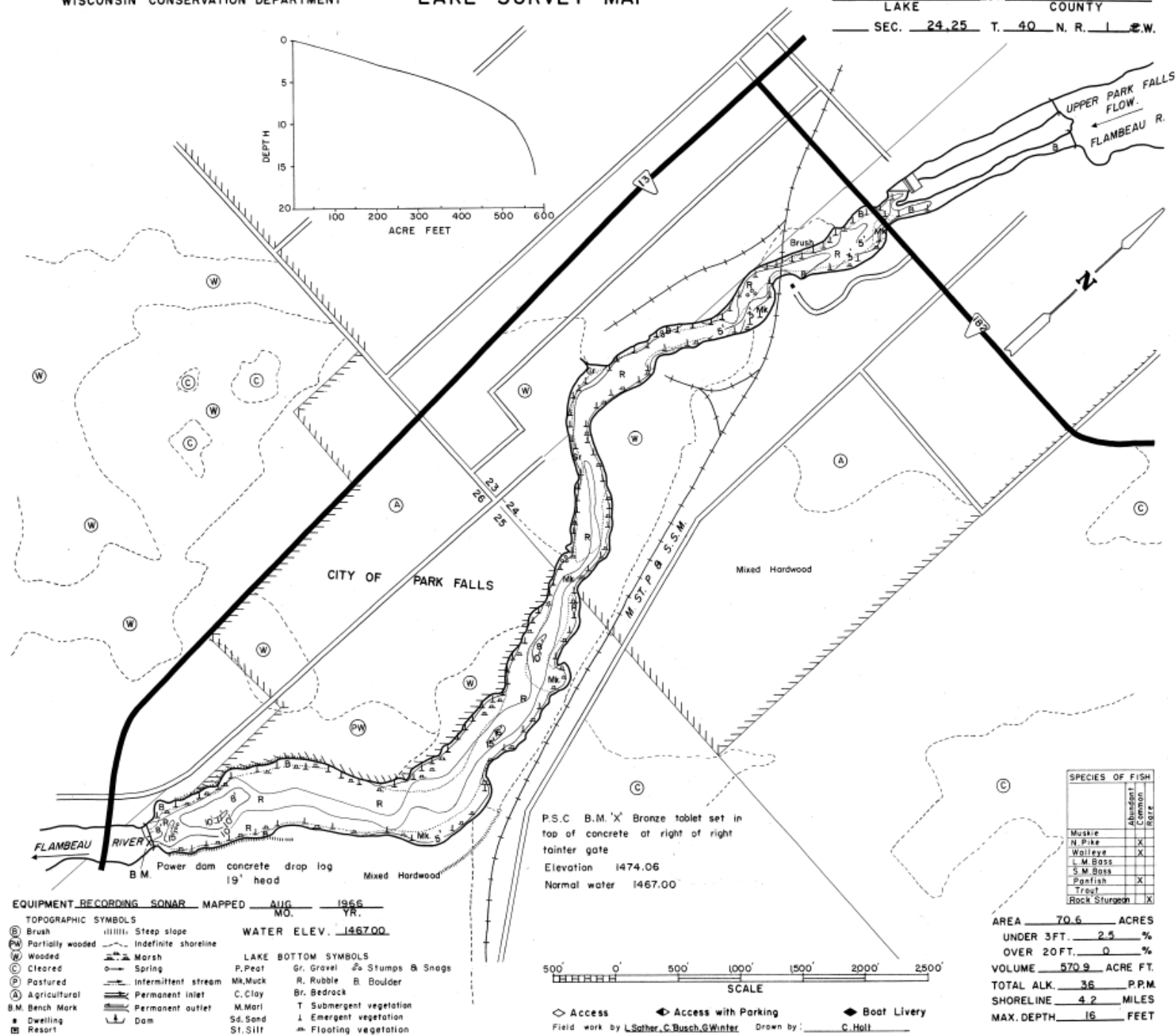
MAX. DEPTH 17 FEET



WISCONSIN CONSERVATION DEPARTMENT

## LAKE SURVEY MAP

LOWER PARK FALLS FLOW PRICE  
LAKE COUNTY  
SEC. 24, 25 T. 40 N. R. 1 E.W.



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## LAKE SURVEY MAP

PIXLEY FLOWAGE

LAKE

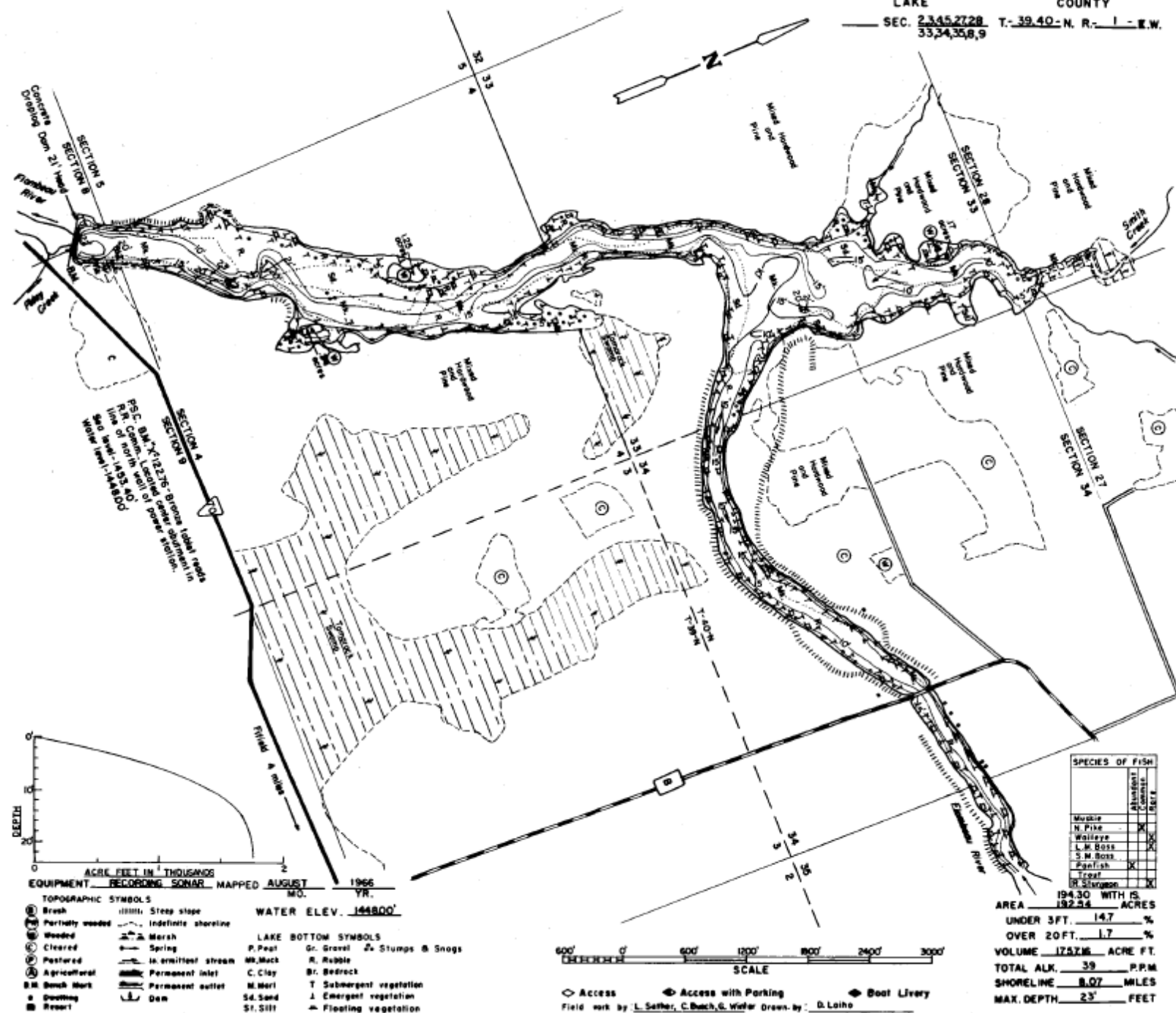
PRICE

COUNTY

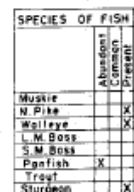
SEC. 2, 3, 4, 5, 27, 28

T. 39.40 - N. R. 1 - E.W.

33, 34, 35, 8, 9







AREA 422.1 ACRES  
UNDER 3FT. 20.8 %  
OVER 20FT. 3.2 %  
VOLUME 3539.4 ACRE FT.  
TOTAL ALK. 38 P.P.M.  
SHORELINE 16.2 MILES  
MAX. DEPTH 23 FEET

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